

LIVERMORE LAB REPORT

A weekly review of scientific and technological achievements from Lawrence Livermore National Laboratory, March 4-8, 2013.

e! Science News IT'S ONLY NATURAL



Sampling site in Bangladesh where thousands of liters of ground water were passed through filters to collect bacteria for DNA dating.

Human activities are not the primary cause of arsenic found in groundwater in Bangladesh.

A team of researchers from Lawrence Livermore, Barnard College, Columbia University, University of Dhaka, Desert Research Institute and University of Tennessee found that the arsenic in groundwater in the region is part of a natural process that predates any recent human activity, such as intensive pumping.

Millions of people in Bangladesh and neighboring countries are chronically exposed to arsenic-contaminated groundwater, which causes skin lesions and increases the risk of certain cancers. Bacterial respiration of organic carbon releases naturally-occurring arsenic from sediment into groundwater, but the source of this organic carbon remains unclear.

To read more, go to [e! Science News](#).



A CHALLENGE OF SUPERCOMPUTING POWER



The Sequoia supercomputer.

The Institute of Electrical and Electronics Engineers (IEEE) has put together a summary of supercomputing predictions and challenges made by a few of its members at SuperComputing 2012 (SC12).

One of those predictions came from Lawrence Livermore's Bronis de Supinski, co-leader of the Advanced Simulation and Computing program's Application Development Environment and Performance Team, who favors the ability to better predict electricity demand on the grid. That means less wasted energy -- and, perhaps, the ability to keep computers from crashing during a power outage.

While de Supinski envisions better power grids, he also warns that the need for cheaper power and less dissipation en route will continue to present problems.

De Supinski also believes memory bandwidth and capacity will continue to fall behind computational power until applications are severely limited by these bottlenecks.

To read more, go to [HPC Wire](#).



NUSTAR GOES FOR A SPIN



This artist's concept illustrates a supermassive black hole with millions to billions times the mass of our sun. Also shown is an outflowing jet of energetic particles, believed to be powered by the black hole's spin. *Image courtesy of NASA/JPL-Caltech.*

NuSTAR is helping solve the riddle of black hole spin.

The formation of supermassive black holes is thought to mirror the formation of the galaxy itself, since a fraction of all the matter drawn into the galaxy finds its way into the black hole. Because of this, astronomers are interested in measuring the spin rates of black holes in the hearts of galaxies.

An international team including Lawrence Livermore scientists has definitively measured the spin rate of a supermassive black hole for the first time.

The findings, made by the two X-ray space observatories, NASA's Nuclear Spectroscopic Telescope Array (NuSTAR) and the European Space Agency's XMM-Newton, solve a long-standing debate about similar measurements in other black holes and will lead to a better understanding of how black holes and galaxies evolve.

To read more, go to [UPI](#).



Windmills in California.

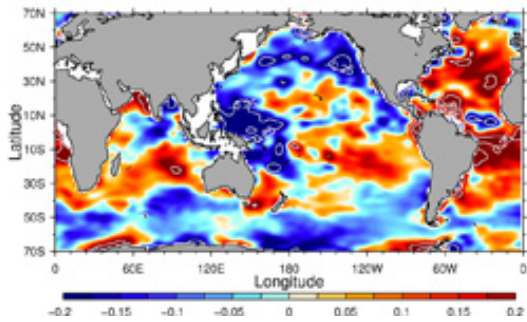
Wind is no longer the energy source of the future. It's ready today.

For years, solar energy has been America's renewable star, yet on cornfields, in cow pastures and across rural ridgelines throughout the Midwest, the prairie states and the West Coast, the amount of energy produced by wind farms has quietly leapfrogged solar and every other form of renewable energy except for old-school hydroelectric.

Since 2008, America's wind energy capacity has doubled, making wind second only to natural gas in terms of new generators coming online in recent years.

Until recently, wind barely registered as a national power source. The annual federal energy assessment by Lawrence Livermore just lumped wind in with geothermal, solar and every other renewable until 2003, when wind finally hit one-tenth of 1 percent of the U.S. power supply. After several years of explosive growth, it now accounts for 3 percent of U.S. electricity. In terms of raw wind power generated, the United States today is second only to China.

To read more, go to [Sierra](#).



Surface salinity changes for 1950 to 2000. Red indicates regions becoming saltier, and blue regions becoming fresher.

A clear change in salinity has been detected in the world's oceans, signaling shifts and acceleration in the global rainfall and evaporation cycle tied directly to climate change.

Australian scientists from the Commonwealth Scientific and Industrial Research Organisation (CSIRO) and Lawrence Livermore have reported changing patterns of salinity in the global ocean during the past 50 years, marking a clear symptom of climate change.

LLNL's lead author, Paul Durack, said that by looking at observed ocean salinity changes and the relationship between salinity, rainfall and evaporation in climate models, they determined the water cycle has become four percent stronger from 1950-2000. This is twice the response projected by current generation global climate models.

To read more, go to the [Toronto Telegraph](#).

LLNL applies and advances science and technology to help ensure national security and global stability. Through multi-disciplinary research and development, with particular expertise in high-energy-density physics, laser science, high-performance computing and science/engineering at the nanometer/subpicosecond scale, LLNL innovations improve security, meet energy and environmental needs and strengthen U.S. economic competitiveness. The Laboratory also partners with other research institutions, universities and industry to bring the full weight of the nation's science and technology community to bear on solving problems of national importance. To send input to the *Livermore Lab Report*, send [e-mail](#).

